



A Furukawa Company

Pump and Signal Combiners
For Fiber Laser and Amplifier Design



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PUMP AND SIGNAL COMBINERS

for Fiber Laser and Amplifier Design

Multimode

Single-mode

Polarization-Maintaining

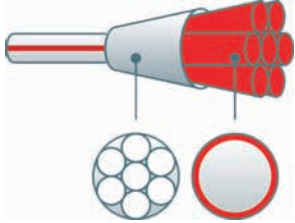
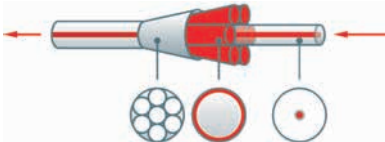
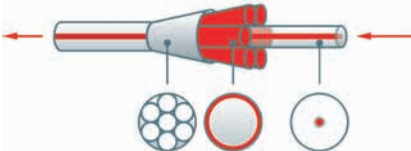
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Pump and Signal Combiners

Multimode, Single-mode and Polarization-Maintaining

Pump and Signal Combiners are available in all-fiber Multimode, Single-mode, or Polarization-Maintaining constructions. They are designed for efficient

coupling into cladding pumped fibers. Custom designs and value-added Gain Module or Laser Assemblies are also available.

Product	Typical Applications	Features and Benefits: MM, SM, PM
<p>Multimode</p> <p>Multimode combiners couple 7 or 19 multimode sources into cladding pumped fiber.</p> 	<ul style="list-style-type: none"> Fiber lasers for use in the following industries: <ul style="list-style-type: none"> Industrial Military Medical 	<ul style="list-style-type: none"> Easy splicing High coupling efficiency Provides scalability Compatible with 915 nm and 976 nm pump diodes with multimode pigtail fiber with 0.15 or 0.22 NA All PM design—PM signal input and output Thermally screened for increased reliability Transmission checked for all ports to increase uniformity Optimized for 1 and 1.5 μm applications Custom combiners available upon request
<p>Single-Mode</p> <p>Single-Mode Combiners couple 6 or 18 multimode sources and 1 single-mode signal source for combined power output or for use with a cladding pumped fiber.</p> 	<ul style="list-style-type: none"> This “Signal fiber design” is used for applications in the following industries: <ul style="list-style-type: none"> Industrial Military Medical A single-mode combiner can be used to construct an amplifier for use in tele-communications 	
<p>Polarization-Maintaining</p> <p>Polarization-Maintaining combiners couple 6 multimode sources and 1 polarization-maintaining (PM) source for combined power output or for use with a PM cladding pumped fiber.</p> 	<ul style="list-style-type: none"> This “Signal fiber design” is used to construct amplifiers requiring signal polarization outputs for use in the following industries: <ul style="list-style-type: none"> Industrial Military Medical Telecommunications 	

Pump and Signal Combiners Specifications

Multimode

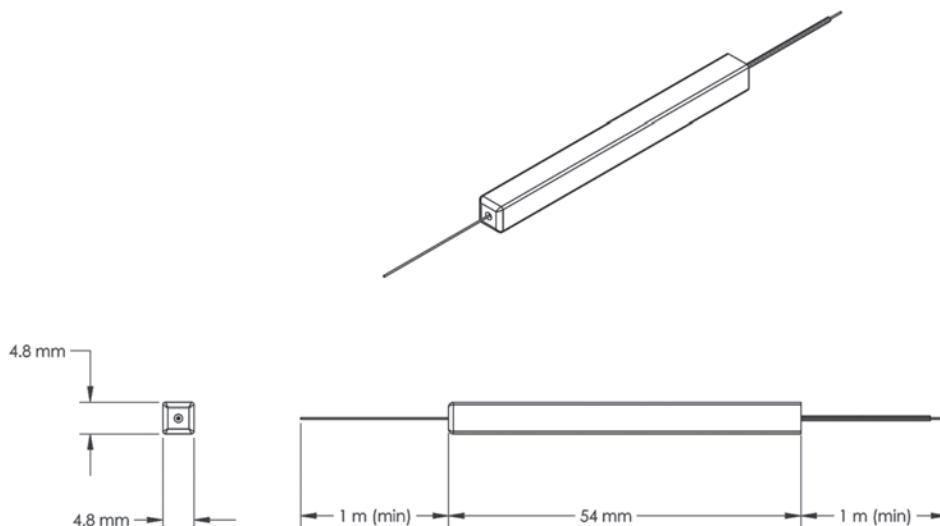
	7 : 1		19 : 1
Multimode Input Fibers			
Number of input fibers	7	7	19
Numerical aperture	.165	.22	.165
Core diameter	105 ± 3 μm	105 ± 3 μm	105 ± 3 μm
Cladding diameter	125 ± 2.5 μm	125 ± 2.5 μm	125 ± 2.5 μm
Coating outer diameter	250 ± 15 μm	250 ± 15 μm	250 ± 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter
Output Fiber			
Numerical aperture	.45 ± .03	.45 ± .03	.45 ± .03
Cladding diameter	125 ± 2.5 μm	200 ± 2.5 μm	200 ± 2.5 μm
Coating outer diameter	250 ± 15 μm	300 ± 15 μm	300 ± 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter
Performance			
Multimode transmission (*2)	>90%	>90%	>90%
Optical return loss	40 dB	40 dB	40 dB
Maximum total input power	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)
Operating temperature	0 to +70°C	0 to +70°C	0 to +70°C
Compatibility			
Recommended for use with these OFS cladding pumped fibers	Yb 130	Contact us for availability	Contact us for availability
Model #	TFB11A0	TFB2220	TFB4120
Order by Part #	108869363L	108885633L200	552HPWR051

(*2) Tested by multimode input light with 70% and 99% of power confined with NA of 0.09 and 0.15, respectively.

(*3) These values are based on testing to date with 25W/leg conditions.

Combiner Mechanical Drawing

Multimode, Single-mode and Polarization-Maintaining Configurations



Pump and Signal Combiners Specifications

Single-mode

	for 1 μm Applications			for 1.5 μm Applications	
Multimode Input Fibers					
Number of input fibers	7	6	18	6	6
Numerical aperture	.165	.22	.165	.165	.22
Core diameter	105 \pm 3 μm	105 \pm 3 μm	105 \pm 3 μm	105 \pm 3 μm	105 \pm 3 μm
Cladding diameter	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm
Coating outer diameter	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter	1 meter
Single-mode Signal Input Fiber					
Numerical aperture	0.15 \pm .015	0.15 \pm .015	0.15 \pm .015	0.15 \pm .015	0.15 \pm .015
MFD @ operating wavelength (1060 or 1550 nm)	8.0 μm	8.0 μm	8.0 μm	10.3 μm	10.3 μm
Cladding diameter	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm
Coating Outer diameter	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm
Splice to SMF28	< 0.3 dB	< 0.3 dB	< 0.3 dB	< 0.3 dB	< 0.3 dB
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter	1 meter
Undoped Output Fiber					
Cladding numerical aperture	.45 \pm .03	.45 \pm .03	.45 \pm .03	.45 \pm .03	.45 \pm .03
MFD @ operating wavelength (1060 or 1550 nm)	7.0 μm	7.0 μm	7.0 μm	6.5 μm	10.2 μm
Cladding diameter	125 \pm 2.5 μm	200 \pm 2.5 μm	200 \pm 2.5 μm	125 \pm 2.5 μm	200 \pm 2.5 μm
Coating outer diameter	250 \pm 15 μm	300 \pm 15 μm	300 \pm 15 μm	250 \pm 15 μm	300 \pm 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter	1 meter
Performance					
Multimode transmission (*2)	>90%	>90%	>90%	>90%	>90%
Single-mode transmission	>85%	>85%	>85%	>85%	>85%
Optical return loss (multimode)	40 dB	40 dB	40 dB	40 dB	40 dB
Maximum total input power	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)
Operating temperature	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C
Compatibility					
Recommended for use with these OFS cladding pumped fibers	Yb 130	Contact us for availability	Contact us for availability	ErYb 130	Contact us for availability
Model #	TFB13A5	TFB2325	TFB4320	TFB13J7	TFB23C0
Order by Part #	108667528L	552HPWR072	552HPWR050	552HPWR092	108667528H200

(*2) Tested by multimode input light with 70% and 99% of power confined with NA of 0.09 and 0.15 , respectively.

(*3) These values are based on testing to date with 25W/leg conditions.

Pump and Signal Combiners Specifications

Polarization-Maintaining

	for 1 μm Applications		for 1.5 μm Applications	
Multimode Input Fibers				
Number of input fibers	6	6	6	6
Numerical aperture	.165	.22	.165	.22
Core diameter	105 \pm 3 μm	105 \pm 3 μm	105 \pm 3 μm	105 \pm 3 μm
Cladding diameter	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm
Coating outer diameter	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter
Signal Input Fiber				
One signal fiber type	PM 980	PM 980	PM 1550	PM 1550
Numerical aperture	8.0 μm	8.0 μm	10.3 μm	10.3 μm
Cladding diameter	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm	125 \pm 2.5 μm
Coating outer diameter	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm	250 \pm 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter
Undoped PM Output Fiber				
Cladding numerical aperture	.45 \pm .03	.45 \pm .03	.45 \pm .03	.45 \pm .03
MFD @ operating wavelength (1060 or 1550 nm)	7.0 μm	7.0 μm	10.2 μm	10.2 μm
Cladding diameter	125 \pm 2.5 μm	200 \pm 2.5 μm	125 \pm 2.5 μm	200 \pm 2.5 μm
Coating outer diameter	250 \pm 15 μm	300 \pm 15 μm	250 \pm 15 μm	300 \pm 15 μm
Pigtail fiber length	1 meter	1 meter	1 meter	1 meter
Performance				
Multimode transmission (*1)	>90%	>90%	>90%	>90%
PM transmission	>80%	>80%	>80%	>80%
Extinction ratio @ operating wavelength (*2)	>20 dB	>20 dB	>20 dB	>20 dB
Optical return loss (multimode)	40 dB	40 dB	40 dB	40 dB
Maximum total input power	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)	175 Watts (*3)
Operating temperature	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C
Compatibility				
Recommended for use with these OFS cladding pumped fibers	Yb PM 125	Yb PM 200	ErYb PM 125	Contact us for availability
Model #	TFB1353FFAxis	TFB23B3FFAxis	TFB1346FFAxis	TFB2366FFAxis
Order by Part #	552HPWR049	552HPWR078	552HPWR047	552HPWR079

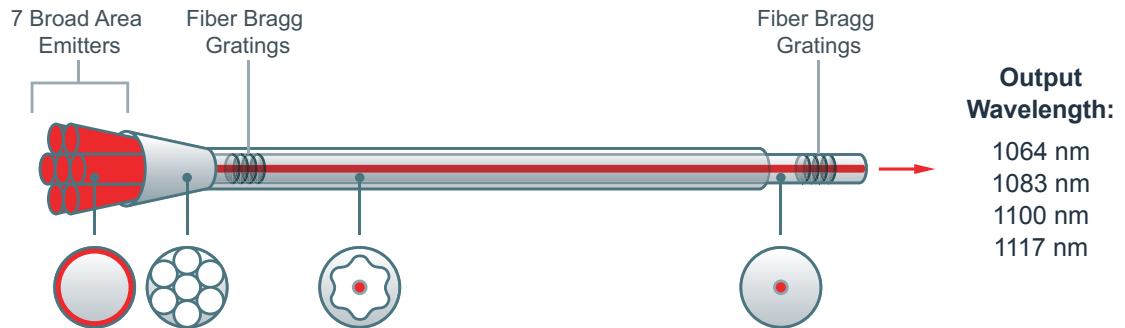
(*1) Tested by multimode input light with 70% and 99% of power confined with NA of 0.09 and 0.15, respectively.


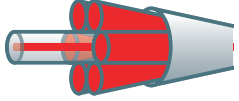
(*2) Axis orientation is aligned for standard designs. Other alignment options are available by request.

(*3) These values are based on testing to date with 25W/leg conditions.

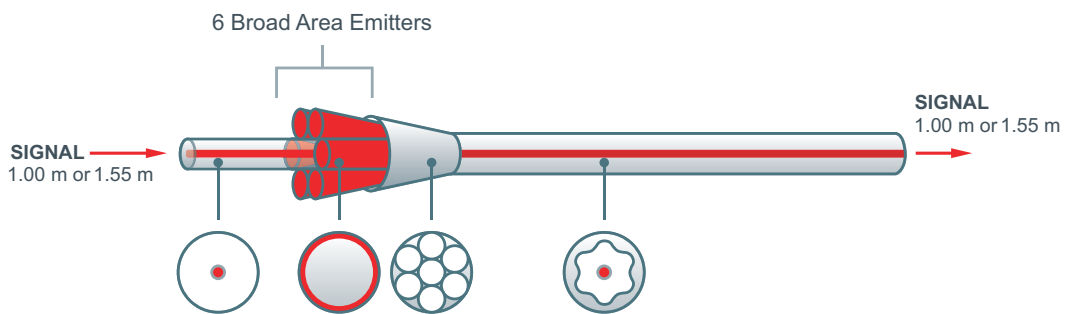
Cladding Pumped Fiber Laser and Amplifier

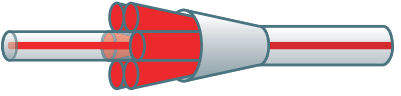
Cladding Pumped Fiber **LASER (CPFL)**



 <p>Cladding Pumped Fibers Also Available Separately</p>	 <p>Combiners for CPF Lasers Multimode Input (105/125 μm) CPF Output (0.45 NA)</p>
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Cladding Pumped Fiber **AMPLIFIER (CPFA)**



	<p>Cladding Pumped Fiber Gain Module Configurations Includes Combiner and Cladding Pumped Fiber Models of Gain Modules Available Yb, PM Yb, ErYb Double & Glass Clad, PM ErYb</p>
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Custom Combiners Available

Options:

N:1

(N+1):1

1:N

Mode Field Adaptor

Single-mode and Polarization-Maintaining Feedthrough

Up to 5kW

Up to 37 Legs

Up to 1 mm Fiber Diameter

For 1 and 1.5 μm Applications

Custom Packages



For additional information please contact your sales representative.

You can also visit our website at www.ofsoptics.com
or call 1-888-FIBER-HELP (1-888-342-3743) from inside the USA
or 1-770-798-5555 from outside the USA.

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